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Prince Bernhard of Netherlands specially flew to Delhi to present the highest Dutch award of "Commander in the Order of the Golden Ark" to Shrimati Indira Gandhi, Prime Minister of India, for her outstanding contribution to the conservation of the tiger, at a colourful ceremony.

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The recent controversy over the proposed translocation of Rhinos from Kaziranga to Dudwa and Corbett National Park in which Assam Government opposes such a move on the plea that Assam will lose the Tourist attraction loses all significance as Assam seems to be unable to protect the rhinos in Kaziranga and the translocation would give the species a better chance of survival.

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All donations will be gratefully acknowledged and the names of donors published in CHEETAL.

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The Order of the Golden Ark

Prince Bernhard of Netherlands specially flew to Delhi to present the highest Dutch award of "Commander in the Order of the Golden Ark" to Shrimati Indira Gandhi, Prime Minister of India, for her outstanding work in environmental conservation, at a colourful ceremony.

The Order of the Golden Ark was established in 1971 by Prince Bernhard (the founder President of World Wildlife Fund and Chairman of Netherlands Branch) to honour those who have earned outstanding merit in Conservation of Flora and Fauna in the world.

At the ceremony he praised Shrimati Gandhi for her contribution in saving the Tiger, the most spectacular of world's carnivora, not only for India but for the whole world.

Akhand Shikar

The Simlipal National Park in Orissa was declared a sanctuary in 1957, was classified as a Tiger Reserve with the implementation of Project Tiger and later was declared a National Park. Some months back it was raided by nearly a thousand tribals armed with bows and arrows and guns and they lit more than a hundred "Ring Fires" to trap and roast and succeeded in killing a few hundred animals. By the time the protection staff reached the place all the tribals had disappeared after their annual "Akhand Shikar".

Such wanton destruction of the country's wildlife heritage cannot be prevented by the enforcement and protection staff alone though they are a necessity. The remedy lies in creating a tribal opinion by conservation education and giving the tribals an economic advantage out of the revenue derived from tourism and forests. The Forest Corporations can play an important role in this and help save wildlife.

Recently more than thirty carcasses of Rhinos were discovered in Kaziranga. They did not die of any disease as their horns had been chopped off—apparently the work of poachers whom the enforcement staff failed to catch.

All such poaching must be prevented at all cost lest the Indian Rhino become extinct.

The recent controversy over the proposed translocation of Rhinos from Kaziranga to Dudwa and Corbett National Park in which Assam Government opposes such a move on the plea that Assam will lose the Tourist attraction, loses all significance as Assam seems to be unable to protect the rhinos in Kaziranga and the translocation would give the species a better chance of survival.

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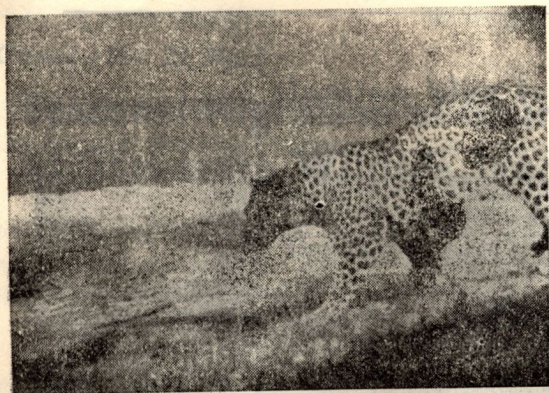
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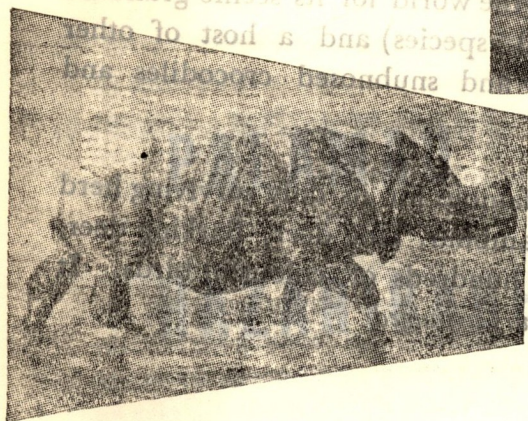
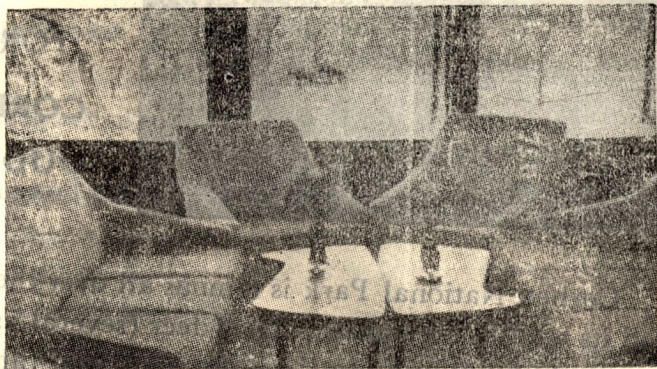
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WEST BENGAL

Seasonal Migration of Gaur (*Bos gaurus* H. Smith) at Garumara Wildlife Sanctuary, West Bengal, India

BY

DEB PRASAD GUIN AND BIKAS CHANDRA PAL

*Ecology, Behaviour and Wildlife Unit, Centre for Life-Sciences, University of North Bengal,
P.O. North Bengal University, District—Darjeeling, Pin-734430, West Bengal (India)*

Introduction

The term "Migration" has been used by various authorities to mean very different things. Migration, as used here, means seasonal to and fro movements. It is often associated with climatic and biological necessities of the animal concerned. Many large ungulates such as moose (*Alces alces*), zebra (*Equus quagga*), thomson's gazelle (*Gazella thomsoni*), Wildebeeste (*Connochaetus taurinus*), etc. exhibit seasonal migration. Usually these animals migrate on the slopes of hills and mountains, and the migration pattern is altitudinal in character (Baker, 1978). This type of altitudinal migration is also exhibited by gaur, the Indian bison (*Bos gaurus* H. Smith) in the Duars region of North Bengal.

In India, gaur is a protected animal for about a decade; but their population has not yet increased appreciably. Shahi (1967) estimated the total gaur population in India to be about only 5,000. Prevalence of rinderpest (Anderson, 1954), epidemics of foot-and-mouth disease (Stewart, 1928; Ali, 1953), predation and/or poaching on calves and indiscriminate habitat destruction are mainly responsible for the present poor statusque of their population. Except Schaller's work in 1977 at Kanha Park, Madhya Pradesh, no detailed study of gaur anywhere in India has been done. Several short observations on gaur, however, are available (Brander, 1923; Hubback, 1937; Spillett, 1967; Sharatchandra and Gadgil, 1975; Shahi, 1977; Johnsing, 1979 etc.)

In view of the present low level of gaur population, alongwith increasing trends of deforestation and encroachment of livestock inside forest areas, detailed study on the biology and conservation of gaur has become urgent. This paper, a part of our larger study started from June 1980, presents seasonal migration patterns of gaur to and from Garumara Wild Life Sanctuary and hill forests of neighbouring Bhutan.

Study Site

The study was carried out at Garumara Wild Life Sanctuary (26° 46' N and 88° 50' E), West Bengal, India. It is approximately 70 kms. north-east of Siliguri and is in the district of Jalpaiguri.

The sanctuary is small in area i.e. about 8.63 km² and is situated within the large reserve forest which continues upto the hill forests of Bhutan (Fig. 1).

The forest is moist tropical type dominated by sal (*Shorea robusta* Gaertn.), along with sissu (*Dalbergia sissoo* Roxb.), kadam (*Anthocephalus cadamba* Miq.), simul (*Bombax ceiba* L.) chalta (*Dillenia indica* L.), etc.

Several small rivulets crisscross through a portion of the sanctuary which exhibit the characteristics of riverain forest. Succession of grasslands can be seen in the southeastern portion of the sanctuary on an area of about 1.5 km². This sandy riverbed area came into existence only recently as the river Jaldhaka changed its course towards the east.

Although small in area the sanctuary abounds with a variety of Wildlife including the Great Indian One-horned rhinoceros (*Rhinoceros unicornis* L.), elephant (*Elephas maximus* L.), sambar (*Cervus unicolor* Kerr.), hog-deer (*Axis porcinus* Zimmermann), barking deer (*Muntiacus muntjak* Zimmermann), wild boar (*Sus scrofa* L.), Leopard (*Panthera pardus* L.), rhesus monkey (*Macaca mulatta* Zimmermann) and a large number of birds besides gaur (*Bos gaurus* H. Smith).

Materials and Methods

Routine daily observations consisted of walking slowly along the firelines, both inside and outside the sanctuary from 04.30 hours to 10.00 hours in the morning and 16.00 hours to 19.00 hours in the dusk. Besides, observations were taken throughout the day and night on occasions. Most of the observations were, however, taken from "Machans" suitably placed in the areas where the animals were most expected to roam around. In addition to Garumara, some occasional tours to Chapramari Wild Life Sanctuary and Jhalong areas were made for collecting information about the occurrence of gaur at those places. Observations were aided by binoculars (7, × 35) and notes were recorded in a portable tape-recorder for future analysis.

Guar are easy to sex but it is difficult to determine their age accurately in the wild. It is, however, convenient to have at least a workable age-scale based on some easily visible morphological structure such as horns, as used by Mc Hugh (1958), Fuller (1959) for the American bison (*Bison bison* L.).

Adult gaur, usually above 3 years, have a massive body with white feet, a dorsal ridge extending upto the middle of the back and a gray boss between the horns. The following categories have been identified for convenience.

- (i) Bulls are more massive than the cows with well-developed dorsal ridge, widely sweeping horns forming approximately a right angle with the head having transverse ridges at the base. The tips of the horns terminate abruptly and usually lie outside the head. The bulls which are 5 or more years old usually have darker pelage and well-developed dewlaps than young

adult bulls whose pelage are less dark and more ash in colour. Identification of bulls were further confirmed by the presence of abdominal penis.

(ii) *Cows*, on the other hand have sharp inwardly curved horns, emerging from the head at an angle of less than 90° . The tips of the horns usually lie above the head. The vulva, situated below the anus, further facilitated recognition of the cows.

(iii) *Juveniles*, usually of 1—3 years, were identified by their smaller body size, straight horns and occasional association with mothers.

(iv) *Calves* less than one year old, always associated with mothers having a golden brown to dark brown coat and with or without small protuberances of horns.

The herds were identified by their composition, sex of leader, persence of particular animals who could be identified by scar and by any other peculiarity.

Results and Discussion

Gaurs are not permanent denizens of any particular area. They exhibit typical seasonal migration between Garumara and hill forests in Bhutan. During the course of our study they were seen at Garumara in June, November, December, 1980 and from January to June, 1981. Rest of the year they were absent from the Garumara Wild Life Sanctuary. They have been spotted east of river Jaldhaka (Fig. 1) neither by us nor by Forest Department Personnel. With the outset of monsoon i.e. May/June the gaur started moving out from the sanctuary area towards the hill forests in Bhutan, which is only 16-20 kms from the study area; and by late June they cleared out from Garumara. With the advent of winter, they again moved down to the study area in the months of November and December (Fig. 2).

The stretch of forests which gaur usually followed during migration is relatively free from human habitation and is limited by the river Murti on the west and by the river Jaldhaka on the east (Fig. 1). On their way they spent sometime in the Chapramari Wild Life Sanctuary which lies on their route and is only about 9 kms from the study site. They have been sighted at several places along their route particularly at the Chapramari and around Jhalong in the months of May/June and October/November by us and by Forest Department personel. They, however, could not be traced in the uphill country in Bhutan due to obvious reasons.

The altitudinal gradients from the study site to the Indo-Bhutan Border and further uphill is gradual and shallow facilitating uphill movements of herds with the new born calves.

It is interesting to note that both arrival and departure of gaur in the study site occurs around a maximum temperature of 30°C (Fig. 2).

Seasonal movement of large mammals is of common occurrence. Migration patterns of gaur as observed in this area is similar to that described by Prater (1971) in Karnataka; but significantly differs from observations of Brander (1923) for Madhya Pradesh. Shahi (1977) also reported that with the onset of monsoon the gaur disperse from Palamau National Park, Bihar. Dispersion of gaur herd in the beginning of monsoon to the hill forest has also been reported by Schaller (1967) and Johnsingh (1979). Spillett (1967) also described gaur to be migratory animals.

Ecological Rationale of Migration:

Figure 2 shows correlation between sightings and meteorological factors such as temperature and precipitation. It also reveals the duration of stay of gaur at Garumara Wild Life Sanctuary and in their hill forest abode in different months of the year. It is interesting to note that the number of sightings consistently dropped from the peak of 34.3% in March when maximum temperature started increasing from 30°C along with the onset of rains to 4.1% in June, and to 0.0% in July, when mean maximum temperature and mean rainfall were 38°C, 28 mm (845 mm)*, and 33°C, 34 mm (1066 mm) respectively. To sum up, per cent sightings varied inversely with the maximum temperature when it is above 30°C.

Statistical calculation reveals a negative correlation between sightings and precipitation ($r = -0.4$). As the coefficient is only 1.3 times the standard error it may be concluded that there exists a fair degree of correlation between them, although it is not statistically significant.

Concluding Remarks

The seasonal migration of gaur as found in our study seems to be mainly altitudinal, associated with physical factors probably regulating distribution and abundance of food plants. Allen (1876) cited by Brink (1980), stated that scarcity of food is responsible for migration of *Bison bison*. Meagher (1973) referred to "biting insect populations" as an important cause for large migrations of wild bison herds.

A few words on management view point need to be mentioned at this point. It is well-known fact that larger sanctuaries serve the interest of wildlife better than the smaller ones. In this area, two sanctuaries i.e. Garumara and Chapramari are separated by a non-sanctuary forest area of only about 9 kms. As such it is proposed that the whole forest area from the north of Lataguri-Ramsai Railway tract to the Indo-Bhutan Border be declared as a single sanctuary. This area would then include both the existing sanctuaries and would be bounded by the river Jaldhaka on the east and by the river Murti and National Highway (N.H. 31) on the west. The forest villagers within this area would have to be rehabilitated outside the proposed sanctuary area for obvious reasons.

*The figures in parenthesis indicate total monthly rainfall.

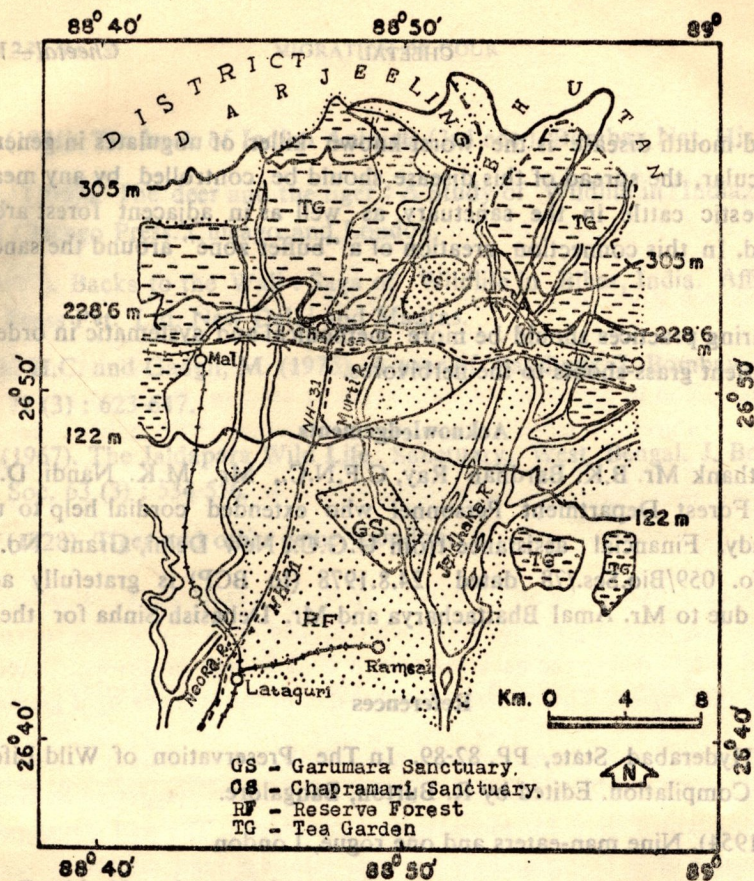


Figure 1. Map showing location of Garumara Wild Life Sanctuary, adjacent reserve forests and tea-gardens.

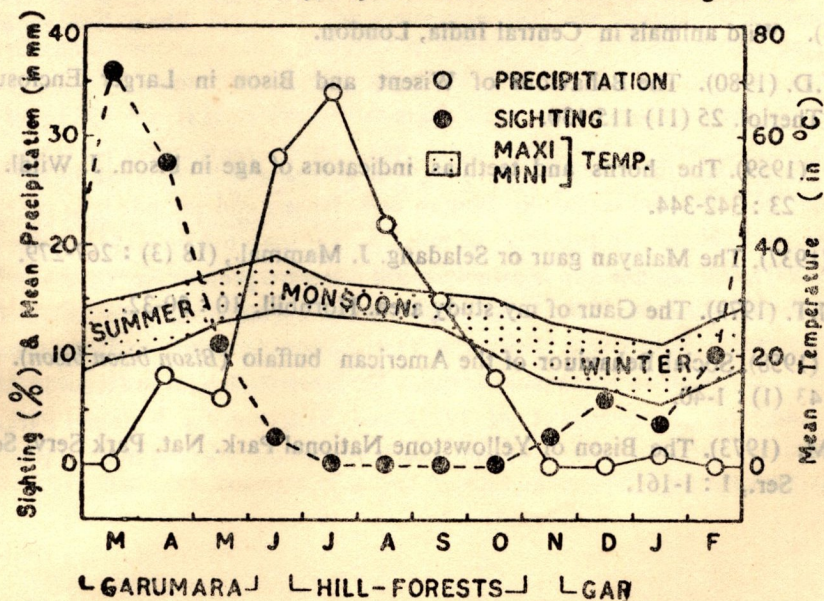


Figure 2. Showing percent sight records maximum, minimum temperature and precipitation in different months of the year.

As 'foot-and-mouth disease' is the worst known killer of ungulates in general and large bovines in particular, the spread of this disease should be controlled by any means. As such grazing by domestic cattle in the sanctuary as well as in adjacent forest areas should be strictly prohibited. In this connection creation of a "buffer zone" around the sanctuary is also important.

Control of firing practices should be more methodical and systematic in order to provide protein rich luxuriant grass-shoots to the herbivores.

Acknowledgements

We wish to thank Mr. B.K. Bardhan Ray, C.F.N.C., Mr. M.K. Nandi, D.F.O., Jalpaiguri and other Forest Department Personnel who extended cordial help to us during the course of our study. Financial assistance from U.G.C., New Delhi, Grant No. F. 23-892/78 (SR-11) Code No. 059/Bio.Sc./78 dated 24.8.1978 (to BCP) is gratefully acknowledged. Thanks are also due to Mr. Amal Bhattacharya and Mr. Debasish Sinha for their encouragements.

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Himalayan Musk Deer in Kedarnath Sanctuary

D. BHATKOTI

Introduction

The Himalayan musk deer used to be widespread throughout the Himalaya. Due to the presence of a musk gland in the male animal, which is used in medicine and cosmetics, this species has been subject to massive slaughter. Together with habitat destruction, this factor has resulted in the decline of the species which is now listed as an endangered species. The research in Kedarnath Sanctuary, supported by the World Wildlife Fund, aims at studying the ecology of the species, in order to decide how best to conserve the species.

Musk deer weigh about 10 kg and measure up to 60 cm at the shoulder. Animals from the Garhwal Himalaya have a grey head and white tipped ears. The throat is whitish, around a central grey oval patch. Along the back the pelage is dark grey or brown, becoming orange-brown around the anal region. The underside and inside of the legs are light grey or white.

Male musk deer possess tusks measuring about 7-10 cm in length. These are used for intraspecific fighting (Flerov 1952), not for digging up roots as suggested by Beddard (1909). The animal is well adapted to cold mountainous conditions. The well developed dew claws provided the animal with a firm purchase on precipitous ground and minimize sinking in snow. The dense coat of thick, wavy hair enhances insulation and enables animals to rest on snow without its melting. Under a scanning electron microscope Singh (unpub) has observed that the hair medulla consists of air-filled compartments, arranged like a honeycomb, which helps insulation.

Distribution

Flerov (1930) has described the distribution of *M. chrysogaster* which is widespread from Pakistan, through N. India and Nepal, to Bhutan and Burma and extends into parts of Tibet and S.W. China. In Pakistan the presence of musk deer is reported by Z. Mirza (pers. comm. cited in Green 1981). In Jammu and Kashmir musk deer are present in most of the forest divisions (Mir cited in Green 1981). Musk deer occur in Kinnaur and Rajgarh in Himachal Pradesh and Kedarnath, Badrinath, Harsil and Tons Forest Divisions of Uttar Pradesh. In Sikkim, the species is found in Khangchendzonga National Park and in Nepal in Lake Rara (Bolton 1976), Langtang (Borradaile et al 1977) and Sangamatha National Parks (Jeffries cited in Green 1981). The distribution of the species is still diminishing due to poaching and destruction of habitat by man and livestock.

Climate and Habitat

The Himalayan musk deer in Kedarnath Sanctuary favours dense vegetation and rocky terrain within the upper forest and scrub level, between 2,700 m and 3,700 m. Forest mainly consists of oak and fir with rhododendron as the understorey. Vegetation is rich in herbs and grasses; more than 300 plant species have been collected from musk deer habitat. The climate is temperate but characterised by heavy snow fall and precipitation during winter and summer, respectively. Temperature ranges from -8.5°C to 25°C in winter and summer.

Table 1
Summary of Meteorological data at Shokh (3,050 m) in 1980

Season	Months	Precipitation		Temperature ($^{\circ}\text{C}$)	
		mm	%	Minimum	Maximum
Winter	Oct.-Jan.	147.3	4.7	-8.5	15.5
Spring	Feb.-May	269.8	6.6	-8.5	25.0
Summer	June-Sept.	2702.6	86.6	3.0	21.5

Behaviour

The musk deer is a shy animal. It is mainly active at night, from dawn until dusk (Green unpbl). In the day time it rests in dense forest. Sometimes the resting places of musk deer have been found in thick forest, maximum visibility from such sites being 10-30 m.

In Kedarnath Sanctuary, the population density is up to 4 musk deer per sq. km (Green 1981). Only solitary animals have been observed. The home range of some individuals ranges from 150 ha to 300 ha. It is observed that musk deer select certain sites for defaecation and use fixed routes for locomotion. Within the home range, musk deer latrine sites have been marked and are checked frequently. Defaecation sites are found to be used more frequently during the rut than in the summer months.

Mating commences in November and lasts until January (Flerov 1952). The oestrus period of the female is one month. According to Bannikov *et al* (in Press) pairing is more usual, although female may occasionally be chased by two males. The gestation period is 185-195 days and the female attains sexual maturity within 16-17 months.

Feeding

The diet of musk deer consists of leaves, needles, grasses, herbs, ferns, mosses and lichens

according to their seasonal availability. Shaposhnikov (1956) identified 49 plants eaten by musk deer of which nine remained as staple throughout the year.

In Kedarnath Sanctuary preliminary faecal analysis by Green (unpubl) indicates the diet to comprise 88-96% herbs and 3.10% grasses in the summer months (May to August) and 59-78% herbs and 17-25% grasses in January-April, when snow covers the ground. In the months of January and February ferns constitute 11-16% of the diet composition. The percentage of mosses is minimal (1%).

Predators

In the Himalaya, the common predators of musk deer are leopard (*Panthera pardus*, *P. uncia*, *Neofelis nebulosa*), wild dogs (*Cuon alpinus*), fox (*Vulpes vulpes*) and Himalayan yellow-throated marten (*Martes flavigua*). In Kedarnath Sanctuary a juvenile musk deer was killed by a pair of martens (Singh unpub).

Conservation

The main reason for the decline of the species is the high price of musk which fetches U.S. \$40,000–50,000 per kg. on the international black market (Green 1981b). Increasing habitat destruction, caused by greater human population pressure on the mountain environment, is also playing a major role.

The Himalayan musk deer is protected under the Wildlife (Protection) Act 1972 and international trade on Himalayan musk is prohibited, according to the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). Nevertheless control of Poaching and smuggling of musk is lacking. From India, Nepal and Bhutan musk is smuggled to the West and Japan. In order to prevent this, the Government should increase vigilance at ports.

In India, National Parks and Sanctuaries come under the jurisdiction of the Forest Department. In the mountains Wildlife Guards need to be equipped properly for high altitude antipoaching work. In view of the difficult terrain, proportionately more staff need to be provided than in similar, protected areas in the plains.

Also local people should be educated in conservation matters. For example, grazing is a particular problem. Traditionally, local people have taken their livestock to high pastures during the summer months. If not controlled, by limiting number of livestock and delimiting areas in which grazing is permitted, habitat destruction becomes excessive and regeneration is suppressed.

Acknowledgement

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Role of Non-Governmental Organisations in Conservation of the Environment

BY

S.K. Roy

Without wanting to be formal in any way in what I hope is going to be a frank and no-holds barred discussion of the role of Non-Governmental Organisations in environmental conservation, I would like to congratulate the Environmental Action Group for bringing together a cross section of individuals who in different spheres and in different parts of the country, have done pioneering work in this field. It gives me very great pleasure to be with all of you, to see some old friends and I hope, to make a large number of new ones. What every one of you is doing and what is being done by many such organisations who are not present here, is of vital national importance. Let us make no mistake about this, however much our critics and opponents may accuse environmentalists of elitism and obstructionism in the face of so-called progress and eradication of poverty. Let us also be clear that while poverty is the greatest pollutant, it is the poor who suffer most, and are most directly affected by degradation or destruction of the environment, urban and rural.

Since we are trying to pool our individual experiences, I propose to summarize very briefly my own motivation and experience. Interest in wildlife was part of growing up in an era when ungulates such as the now totally protected and gravely endangered chinkara and black buck, were visible on the outskirts of Delhi and of many of our then less crowded towns, and peacocks and partridges were an intergal part of Delhi's gardens. Concern about wildlife started during World War II, from reports of large scale massacres of wildlife with machine-guns in forest areas where there were heavy troop concentrations. It became critical when returning after many years abroad, I found both the chinkara and the black buck had virtually disappeared from the Northern plains (except in a few areas). This was followed by seeing extensive deforestation during several thousand miles of trekking in the Indo-Tibetan border areas. As a result, almost 25 years ago, I decided that if I ever had enough money to live on, I would retire prematurely from the Foreign Service to concentrate on creating greater public awareness and involvement in environmental conservation. Fortunately, six years ago, I was able to do this and have since been working independently on a self-financed basis. I must add that my concern had over the years expanded beyond conservation of wildlife and forests to an awareness that we had to consider the total environment—land, water and air.

There were always a number of individuals, including dedicated officers of the Forest Services who have consistently expressed their concern about the deterioration of the

environment. It is only logical that this has resulted in the establishment of numerous environmental groups all over the country. The emergence of such a large number of organisations from the Friends of the Trees to the World Wildlife Fund, and Kalpavriksh is one of the most encouraging events in a non-too-cheerful national or global situation. However, most of this rests on individual efforts. With few exceptions, we have not really been able to institutionalize non-Governmental efforts in the overall field of environmental conservation. A good example is what is perhaps the oldest Non-Governmental organisation in the field, the Wildlife Preservation Society of India. It was established in 1958, 3 years before WWF Morges came into being, which was followed about 10 years later by the WWF (I). It is surviving, and that only barely, entirely due to the self-sacrificing dedication of 2-3 people.

There is a lesson in this for all of us, because we are all too familiar with the existence of committess in which most members do little more than attend meetings, and some who do even this spasmodically. We have to identify people who will not be more "sleeping members", but will actively involve themselves in pursuing the objectives of the organisation with a total commitment to its purposes. Frankly, in setting out on my own, I deliberately decided not to join any organisation because I really was not interested in any official standing, but only in doing whatever little I could on as broad a basis as possible. This somewhat impractical concept has proved more functional than I would have believed possible. I have been able to undertake missions and generally involve myself in the activities of a large number of different organisations. My interests have ranged from the environmental aspects of large dams to the air and water pollution from industries, specially large thermal power stations; from water management of our major river systems (now and in AD 2000) to the environmental damage from poorly planned irrigation and drainage and the pollution of too many of our rivers; and from the conservation of wildlife to intense preoccupation with protecting and preserving our rapidly disappearing forests.

Let me say immediately that I recognise the limitations and indeed inadequacy of my approach. I consider that there is an urgent need to build up an institutional framework, both for individual non-Governmental organisations, and for the collective co-ordination and application of all our efforts at the national level. Like the famous story for the Indian fables in which an ailing father demonstrates the importance of unity to his sons by easily breaking one stick, but unable to break several together. I had occasion to see this during visits to important cities all over India as leader of a UN Environmental Programme project. In fact, our convener, Mr. Mathew was Member-Secretary of the group. We found a great deal of enthusiasm, and in some places, considerable effective action by small groups about which little or nothing was known outside very limited areas and, inevitably, the impact was limited. More recently, I have seen that a nodal organisation like the Indian Heritage Society was able to influence Government considerably on issues like conservation of the Taj

Mahal, the Old Fort and Dal Lake. I am also aware of the gradual emergence and readiness of individual organisations to challenge Government decisions through legal action, and with the support of distinguished lawyers who have been prepared to lend their support freely. But this is not as widely known as it could and should be. Indeed, very few organisations are aware of what is being done by others, and I am afraid, there is even a tendency for a competitive rather than a co-operative approach.

While this is a part of the Indian reality, non-Governmental organisations who want their efforts to make a real impact on Government have to recognise the need for a very close working relationship with each other. Indeed, it is necessary to encourage the emergence of such organisations wherever a sufficient number of people can get together to create one, and information on their efforts should be available to a central source or sources. In fact, membership should expand even beyond this to individuals in small district and sub-divisional towns, because only through this can there be collective awareness of the damage being done to the environment as a whole in different parts of the country. In effect, field observers and those in different parts of the country are the eyes and ears of what must become a mass movement for the conservation of the environment.

Government has, as we have seen from recent policy decisions, a very positive approach, but the establishment of the Department of Environment and the enactment of legal control measures are meaningless in themselves, without public interest and support in their implementation. The official machinery of Government is not really equipped to tackle everything by itself, and there will be occasions when in addition to support, it may be necessary to point out failure and also where absolutely essential, institute legal action. I had thought of giving examples of the success of non-Governmental organisations in the USA or UK, but neither the approach nor the functioning can easily be applied to Indian conditions. They have adequate funding so that although based on voluntary action, these organisations are staffed by well-paid, permanent salaried officials. In India, almost all organisations have to rely on voluntary effort without the funds for permanent staff, and this is unlikely to change substantially in the foreseeable future.

What then can we do to draw maximum national benefit from the involvement of the growing numbers of non-Governmental organisations in environmental conservation? The obvious first need is to evolve a co-operative basis, and to identify organisations in all the major centres which can act as nodal points for action. For instance, if an environmental issue relates to Kerala, there should be an identifiable influential source which can obtain substantial public and local Government support. This would apply to all states and union territories. Equally, if not more important, is the capacity of such groups to work with a nodal organisation in the capital if the Government of India is to be involved. I mention this

particularly because my rather gadfly approach has brought me in contact with a number of organisations working separately on the same issues without pooling their efforts. A classic example was provided first by the Taj, where there was more vocal public concern in some Southern states than in Delhi, and no concern at all in Agra itself. A better example perhaps is the "Silent Valley" in Kerala. There were very active groups working in the State, another capable individualistic element in Bombay, and a third in Delhi, with very little interchange of information and without apparent collective action. I think we have to acknowledge to ourselves that it is going to be quite some time before any large numbers of people will either support financially, or work voluntarily for environmental organisations. Therefore, we have to make the maximum impact through the kind of co-operation and collective action which I hope emerges from the deliberations at these meetings.

Workshop on Techniques in Wildlife Research and Management

Kanha National Park, January 4-11, 1982

This convocation of scientists believes that the many points which arose as a result of this Workshop will be covered with the timely constitution of:—

- (1) An Asian Wildlife Ecology and Management Association is formed with an annual region-wide technical meeting whose theme at the first meeting is the inventory and assessment of regional nature systems.
- (2) A National Wildlife Research and Training Institute which will foster quality research and training in Wildlife and associated sciences.
- (3) A Committee of Wildlife Scientists constituted by the Government of India to formulate research priorities, monitor and update them.
- (4) Another such Wildlife Workshop at an appropriate future date.

Some Observations on Wildlife in the Upper Suru/ Northern Zaskar/Markha Valley of Ladakh

ASHOK NATH

Box 17035, S-161, 17-Bromma, Sweden

Introduction

In the months of March to May 1981, I did a trek from Kargil via the Suru valley into Zaskar and then along the Kurna river to Markha valley and on to Spituk monastery near Leh. The journey involved walking over 500 km of rough terrain and crossing five high altitude passes. This report briefly summarizes my observations on the habitat I passed through and some observations on the snow leopard (*Panthera uncia*), wolf (*Canis lupus*), red fox (*Vulpes vulpes*), the ibex (*Capra ibex sibirica*) and the Ladakh urial (*Ovis orientalis-vignei*).

The Area and its Geography

(Conditions mentioned refer to post winter and early spring, i.e. March to May, 1981)

(a) The Suru Valley

Extends southwards from Kargil following the Suru river till its origin from the glaciers near Pensi la pass. The river runs SE to NW and drains into the Indus river near Kargil. Elevations in the area range between 9,000 ft. and 12,000 ft. along the river and gradually increase Rangdum onwards upto the base of its origins at Pensi la (14,500 ft.). The highest peaks in the Suru region are Nun (23,440 ft.) and Kun (23,250 ft.). The average elevations of peaks being 18,500 ft.

30 km south of Kargil the area in early March was under $1\frac{1}{2}$ ft of snow. From Parkachik to Rangdum the snow was between 3-4 $\frac{1}{2}$ ft. The approach till Rangdum (13,530 ft.) is to follow the Suru river upstream. A motorable fairweather road exists which opens in the beginning of July. For the greater part of the year the road is snow bound, it is also geologically badly aligned along unstable slopes which constantly bring down tons of snow, rock and scree slips. Virtually no humans move between Zaskar and Suru until after mid-April, when the snow has hardened sufficiently to walk on. The temperature variation was considerable, in the lower Suru valley the minimum -18°C and the maximum $+25^{\circ}\text{C}$. In the upper Suru, a typical temperature reading would be: 06.30 hrs. = -2°C , 10.30 hrs. = -6°C , 12.30 hrs. (with bright sun) = $+27^{\circ}\text{C}$; direct sun rays would measure to a burning $+45^{\circ}$ – 50°C , after sundown the temperature dropped well below zero, and on two occasions temp. at 20.00 hrs. was -28°C and -30°C .

(b) The Rangdum Table Land

Although physically this area can be classified as among the higher elevations of the Suru

vally, it has its own peculiarities and so I describe it under its own sub heading. The Rangdum area is one of the coldest inhabited regions of the Himalayas, in January the minimum temp. drops to -45°C . It is exposed to high winds and is on a trijunction of 4 valley systems. The average elevation of this area is 13,500 ft. The Rangdum area harbours two small villages and one large monastery. In summer it is also one of the greenest places of upper Suru—the vegetation turns a riot green. In March it was covered under a $4\frac{1}{2}$ ft. blanket of snow. The area is also prone to unpredictable weather changes. On April 1, 1981, it started snowing, and after 48 hours, when it had finally stopped, fresh snowfall measured 2 ft. The plateau is surrounded by high steep mountain cliffs with average elevations of 19,000 ft. The composition and texture of these cliffs is mostly loose rock with shale slopes.

My route beyond Rangdum also followed the Suru river upstream—in March/April the river is a small fast flowing stream, at most places a thin sheet of ice covered the flowing water, the river being in the process of thawing. The river has its origins from the glaciers surrounding the Pensi la area (14,550 ft.). It is after crossing this pass that one enters Zanskar.

(c) The Zanskar Valley

It can be divided into four areas:

- (i) The approach
- (ii) The valley along the river Stot
- (iii) The valley along the river Lunak
- (iv) The Zang la area

(i) **The approach :** After the steep descent from Pensi la the route is downstream along the Stot river. In April, it was snow bound with approximately 3 ft. of snow, which melts not before mid June. A sharp turn left (after approximately 30 km) brings one to the first village of Zanskar.

(ii) **The valley along the river Stot:** This valley is the most densely populated in Zanskar. Maximum village settlements are on the left bank—steep mountains rise on either side—the average elevation of the valley would be around 13,000 ft, the highest peaks not exceeding 20,000 ft. The valley is snow bound from Karsha in the east to Chibra, the first Zanskari village in the west. Karsha, a large monastic village, is near the confluence of Stot and Lunak rivers, which meet to form the river Zanskar, which flows north-east through deep gorges to meet the Indus near Nemu. This area has 18 villages and the majority of Zanskar's 12,000 inhabitants live here.

(iii) **The valley along the river Lunak :** It is the southern area of Zanskar and originates from near the Shingo la (16,772 ft) area. In March/April, the area was snow bound. I did not go into the Lunak area, though I feel the area has its own peculiarities and should be studied as a separate unit.

(iv) **The Zangla area :** Lies east of Padam, i.e. east of the junction of Stot and Lunak rivers. It was interesting to observe that in March/April, there was no snow in this area. Snowfall is very little, not more than 6 in, and it snows in January. The snow does not last after mid-February. Zangla comes partly under the rain shadow area like the greater part of Ladakh. This area has some of the most interesting hard rock formations I have ever seen; with its high cliffs, caves, folding mountains, with narrow ravines, it looked a typical area that harbours within its fold high altitude predators like the snow leopard. The temperature was comparatively warmer to that of the western part of Zaskar. Average day temperature $+10^{\circ}\text{C}$, night -5°C .

From Zangla I followed a narrow trail along loose rock cliffs leading to the summit of Cha Cha la pass (16,500 ft.). A descent and then through narrow gorges with the width at places being not wider than 1 metre, and making observation difficult. Lower down the route followed the Kurna river along very steep and uninhabited barren mountains. The river had to be criss crossed 108 times. After crossing the Langru la pass one follows a rocky and dry stream bed to enter the Markha valley that runs horizontally north-south.

(d) **The Markha Valley**

The area comes under the rain shadow belt and has not more than 3 inches of snow in January—the snow melts away not staying constant for more than a week. The area has steep mountains of a rocky and barren character. The valley along the river is a contrast to the brown mountains surrounding it, being green with bushes, willow trees and dense growth of thorny scrubs, a metre tall. The human habitation is mainly confined to the Markha village, a settlement of approximately 40 people. The valley in addition has isolated settlements at Sku and Skio. The main occupation of the people is sheep farming, which they have constantly to protect against wolves.

The average elevation is 12,500 ft. and the average day temperature was $+15^{\circ}\text{C}$, night -2°C (April/May).

Wild Life

The specified mountain areas that I visited during March to May did appear to harbour a fairly large number of ibex, wolves, red fox and the shapu or the Ladakh urial. I could also collect evidence of the area of operation and an approximate estimation of the numbers of snow leopards operating in the areas specified.

Snow Leopard

The *Panthera uncia* is an endangered species about which very little is known in the wild. Though I was not fortunate enough to see one, on two occasions I missed seeing them by a few hours. I was also lucky enough to examine one. It met its death as a result of what was a

fantastic encounter between predator and prey. This snow leopard had apparently attacked an ibex near a vertical cliff edge (17:000 ft.). The ibex jumped over with the snow leopard on its back, both fell to their deaths three thousand feet on the rocks below. The hot rays of the sun combined with the effective griffon vulture had taken its toll, it was also in a state of decomposition. On examination it measured: head and body 3 ft. 7 in., tail 3 ft. 1 in. It was a male, full grown, its canine looked old being worn out and yellowish. The hair near its face rather white with a slight yellowish tinge. The overall coloration greyish white with black spots.

Locally the snow leopard in Zanskar, Suru and Ladakh is called "shan". Its habitat is normally between the treeless alpine and the sub alpine zones. In winter it descends to the upper valley bottoms, where, on occasions, it enters domestic cattle pens. In March 1981, a snow leopard killed all of a total number of 11 sheep in a cattle pen in Suru. It had entered the small room through a flimsy window. The sheep and been killed by strangulation with canine bites from the top end back of neck. None of the sheep were eaten. I would like to point out that every villager I met, and who claimed to have seen a snow leopard or had lost their domestic cattle to one, are of the belief that the snow leopard drinks its prey's blood. It is then they state that "we can kill it with ease, for the shan behaves in a manner of a drunk lying in a state of semi stupor". This is interesting to note; I interviewed 42 villagers in Suru, Zanskar and Markha valley, who had claimed to have seen the snow leopard in their area. Out of these, 4 claimed to have seen killing of their cattle by a snow leopard. Two claimed to have watched the snow leopard drink blood from its prey immediately after killing. One villager witnessed a snow leopard killing a dzo (cross between yak and cow) in November 1980. His description of the method of attack — 'It was on higher ground and moved from rock to rock, cautiously approaching the dzo from behind. When it had come close, it did not jump directly onto the dzo, it took a short jump near it before leaping on to its back. It then sank its teeth on to its back while gripping the shoulders with its frontal claws, and all along it seemed to lash out with its tail. The dzo put up a brief struggle before sinking to the ground. The leopard held on, and then released its hold and bit lower down. It then appeared to drink the blood for about half an hour, then got up in a stupor swaying about in a drunken motion. "By this time, the man witnessing the event was joined by the owner of the dzo. Together they drove the snow leopard away by throwing rocks. The domestic prey of snow leopards consist of dzo, pony, donkey, sheep and dogs. They, as a rule, never attack a yak. I had seen solitary yaks left to graze for months, with the owner confidently asserting that it would not be touched. It turned out to be true, and I heard of no report on a yak being killed by a snow leopard. There was no report of any human being attacked either. Snow leopards are not aggressive like the *Panthera pardus*. A few years ago,

villagers of Karsha cornered and killed a snow leopard with sticks and rocks. By all accounts, it put up very little resistance.

The mountain cliffs are so steep in Zanskar that at times a snow leopard attacking its prey like the ibex has fallen. One such incident was witnessed by Lobzang Tsering, a forest guard at Zanskar. A snow leopard attacked an ibex, which jumped off the cliff. Both came down hundreds of feet. The ibex was killed by the impact, the leopard apparently got away unscathed.

A common practice amongst villagers in Zanskar when they kill a wolf or a snow leopard is to skin the animal, then stuff it with straw. Then the person in question will take it from village to village, where he is rewarded in cash or kind, specially from those who had lost a sheep or dzo. Maximum sightings of snow leopards by the people of that area is usually December/January, as they come lower down with the ibex and urial herds they usually stalk. Their mating season appears to be November/December.

In order to get an approximate census on snow leopards operating in these areas, I have mostly relied on information given by villagers, killing of domestic cattle by them and the number of snow leopards shot or killed in the area. In some cases I could examine fresh snow leopard tracks, though this usually confirmed the villagers accurate statement saying that (?) snow leopard were operating in a particular area. Owing to the inaccessible nature of the terrain it would not be possible to get a detailed figure.

In the Suru valley the area north of village Juljuk and south of the Nun-Kun, Sickle moon area: 6 snow leopards, two were shot by a certain Ghulam Mehdi, proprietor of Snowline hotel in Suru. By all accounts 4 continue to exist. I could examine tracks of one over the Parkachik la pass, and two sets of tracks south-east of village Parkachik towards Rangdum. In the latter case, the snow leopard had unilaterated at intervals of 2 km and scrapped the snow nearby.

In the Rangdum area the villagers claimed that 3 snow leopards were operating in the winter of 1980-81, between the months of November to March. It is quite likely that a larger population of snow leopards exists. I saw two snow leopard trails near Pensi la. This area has the largest concentration of ibex (300) in the area.

The approach: Around Pensi la and towards Zanskar: Two snow leopards, possibly a pair. These snow leopards appear to cross the Pensi la to and fro in more or less constant pattern following the ibex herds inhabiting that area. I followed snow leopard tracks for 3 days approximately covering a distance of 45 km through heavy snow. As this region is not inhabited, my source of information was based on the tracks I saw and followed.

The valley along the river Stot is the most dense humanly populated area of Zanskar. Snow leopards are occasionally seen by villagers in the months of November to January, when they come down and may prey on village cattle pens. A dzo was killed in January 1981 in the Abrang nallah area close to the village of Abrang. Residents assert that a pair usually haunts that nallah, which is also regularly visited by a herd of ibex. I would suggest that this valley now has the least concentration of snow leopards in Zanskar. According to accounts by village elders shans were seen quite often 20 years ago, but not so now.

The Lunak province in southern Zanskar is one of the least humanly populated area of that region. It is in this area, by all accounts, that a fairly large number of snow leopards exist. I could not verify this statement due to shortage of time and also since my route lay eastwards to Zang la.

The Zang la area, which lies east of the river junction, is another area where snow leopards can live and breed without much interference. The fantastic and forbidding cliff features makes this a perfect natural habitat of the snow leopard. Number of nallahs run at right angles to the Zanskar river. It is in these nallahs, which is also frequented by ibex herds, that snow leopards haunt. I could get a fairly reliable figure of 4 snow leopards inhabiting that area. These figures refer to the area between the junction and Zang la village.

The narrow footpath east of Zang la village leads to the Cha Cha la pass (17,000 ft.). It is difficult mountain country and equally difficult to follow tracks on hard soil. On three occasions, I could examine snow leopard droppings, which contained tibetan snow cock feathers. This area has snow leopards though I could not come to any definite figure.

The snow leopard population in the Markha valley has increased from 3 to 5. In the months of December to February, they usually are closest to human habitation, and between November 1980 and March 1981, they killed 2 donkies, 1 pony and 3 sheep. Their natural prey in this area is the Ladakh urial, which exists in large numbers. The total amounts to 22 known snow leopards operating in these areas.

Wolves (*Canis lupus*)

The largest population of wolves in the western and central Himalayan regions exists in Zanskar. In all the Himalayan areas visited, I have yet to see a larger concentrated activity of wolves than that existing in the Zanskar-Suru-Markha area.

The local name of wolf is "shanku" with the odd black wolf being called "shangnak". The average build of Himalayan wolves is 75-80 cm height, 95-110 cm length. They weigh approximately between 35-55 kg. Their colour is greyish brownish. The grey being more dominant. The black wolf's coat being of a much darker shade, but never quite black.

I could make first hand sightings of 4 wolves on two separate occasions, and near the Pensi la area I could observe the method of attack or tactics used by 3 wolves to trap and kill a full grown male ibex. This is how I could reconstruct it: "Two wolves stalk, an ibex herd, they approach from opposite directions. The main herd runs uphill with the exception of an old male, which possibly does a diversionary manouvre trying to get wolves off the herd. Ibex runs downhill, tries turning to gain higher ground, but cannot as wolves on either side press it to run downwards to a flat large patch, which is mostly loose snow. The third wolf, which has all along been waiting in a ambush behind a rock pounces on the ibex, now considerably slowed due to soft snow. It is caught by the throat, a struggle follows and the ibex, with its main jugulars cut, has no chance. By now all three wolves have the ibex in their grip. The wolves eat approximately 30 kg of a 80 kg ibex in their first meal."

In the winter months of November/December, when snow measures approximately 5 ft., it is relatively easy to catch ibex, the snow is soft and the cloven feet of ibex sink deep in the soft snow. They are easy prey for wolves, snow leopards and even humans, specially those that are a bit older or sick.

It is difficult to tell accurately, with a few sightings wolves, whether they are more nocturnal or operate by day in the winter. The ibex was killed in the morning between 9.00 to 10.00 hrs. The wolves came for their second meal at 19.00 hrs., when the sun had set and the moon was out. Visibility at higher altitudes is fairly good all night round, specially if the sky is clear allowing the moon to reflect its light on the snow. The temperature conditions made little difference to their feeding habits. At 10.00 hrs temperature was $+15^{\circ}\text{C}$ and at 19.00 hrs. -22°C . I noticed the wolves did not all come together. First came one wolf and halted short of the dead ibex. It bayed and was answered almost immediately by another and after an interval of 3 minutes by the third wolf.

Wolves do generally not operate in large packs. In these areas, they might group together for hunting purposes. The residents of Zanskar and Suru report that they have not seen more than 1-3 wolves together. An exception is the Markha valley, where a pack of 9 wolves was operating in the winter of 1981.

That the wolf is extremely shy of humans was evident, when a lone wolf and I simultaneously spotted each other, and even though the distance between us was about one kilometer it changed its direction and ran up-hill. It kept on running until it had reached a crest of a cliff. Not once did it pause to look back.

Wolves prey on domestic cattle and ponies quite frequently. Almost every villager, who has sheep out for grazing, loses an average of 3 sheep per owner per year. Attacks on

yaks are rare. There was no report of a human killed or attacked by wolves. Although not too long ago (in the 1960's), travellers passing through the Zang la area were attacked by wolf packs.

The wolf population is kept in check by villagers, who go hunting for wolf cubs born usually in May. The cubs are killed. Occasionally, a cub is brought down by the villager of these areas. There is no record of a cub having survived its captivity.

It is difficult to give an accurate figure for wolves. A figure of 100 for Suru, 250 for northern Zanskar and 150 for Markha valley would be a rough estimate.

A Short Note on Wolf Traps in Use in Zanskar and Markha

The Pit: The pit is normally 9 ft. deep with rock slabs forming a circular wall. The rocks are so placed that they cave inwards at the top. A sheep is placed inside. Its frequent bleating usually attracts wolves. Once they jump in it is impossible to come out. The villagers kill the wolf by throwing rocks and boulders at it.

The Stone Trap: Consists of a large boulder with a stick and a piece of wire, which has meat on one end. Once the bait, i.e. the piece of meat, has been pulled the stone dislodges, crushing the wolf under its weight.

Ibex (*Capra ibex sibirica*)

Ibex are found in fairly large numbers in the upper Suru, Rangdum and the Pensi la belt. In the Stot valley area they are not as many as they once were, though due eastwards towards Zang la they are also to be found in large numbers.

Locally the ibex is called "skeen". I could examine a dead ibex male, its height at shoulder 102 cm, horns measured 33 in. It weighed approximately 80 kg. The coloration is brownish-grey. In many cases, I noticed that the males had pronounced lighter markings on the back compared to the darker brown in the lower half of the body.

Ibex grazing could mainly be seen from 10.00 hrs till about 15.00 hrs. They usually came out in good weather conditions, i.e. when it was sunny. I rarely saw any ibex grazing in cloudy weather. They usually had their chosen favourite grazing spots, which were regularly frequented by them. The grazing area was a snow slope varying from 40° gradient to 65°. To get at something edible to eat beneath the snow, the ibex would paw vigorously with one of their forelegs and nuzzle around in the gap. What they normally found there was dried grass, some of it in the process of thawing.

I could observe 5 herds, totalling 87 ibex. Male ibex averaged 2-3 per 10 females. To get an approximate figure on ibex in upper Suru and Rangdum: 400, the Stot valley area: 150, towards Zang la: 250.

It was interesting to note that the ibex is not found in the Markha valley area.

The Ladakh Urial (*Ovis orientalis*, sub race *vignei*)

The area east of the Cha Cha la pass (16,500 ft.) is the habitat of the Ladakh urial, called "shapu" in the local language. Urials are said to be low country sheep. However, evidence pointed otherwise in the case of the urials inhabiting the area east of Cha Cha la and the Markha valley. The first herd consisting of two males and 7 females was spotted on a steep cliff feature at an altitude of 13,000 ft. The urial is absent in western Zaskar, where winter conditions are severe with heavy snowfall. The eastern parts, where the rain shadow belt starts, with very little or no snow, is their natural habitat. The urial's coat is an almost perfect camouflage for the terrain it inhabits. Light brown to beige with lighter markings in the lower half of the coat.

I could spot 4 herds, most of them a complete family unit with male, female and young urials. An approximate figure on urials in that region would be 300.

The Red Fox (*Vulpes vulpes montana*)

Locally called "vatseh", the Himalayan red fox is well endowed with superb fur and a very bushy tail to stand the rigours of the extreme winter. The coloration of their coat varies. I could observe a total of 12 foxes in the upper Suru valley, the Rangdum, and in the Stot valley areas of Zaskar. The coloration varied from a rusty red to greyish white and light rufous. On clear, sunny days, foxes would come out of their shelters and sleep, lying tightly curled with their tail used as an insulator against the snow. This way, it was very difficult to make out between an exposed rock and a sleeping fox. As a rule, foxes appear at dusk to search for food. There was one exception, a fox trying to catch fish near the Sani Gompa in Zaskar at 13 00 hrs. Food is hard to come by in winter, and so many times foxes would come near villages to eat human excreta. The lamas of Rangdum Gompa usually feed the foxes with balls of satu during the winter months. At dusk, foxes (I counted four) would come below the wall of the monastery and wait until bits of food was thrown to them. Most red foxes operate in pairs, it was seldom that I saw an entirely single fox. Following track patterns on the snow, I found that the harsh winter takes a large toll of weak foxes unable to fend for themselves or to cover long distances required in search for food. The trail pattern suggested some foxes dying of weakness or possible exposure, due to fat and energy reserves being expended.

Other Mammals

Markha valley is also the home of a herd of 5 nayan or great Tibetan sheep. This race, *Argali ovis ammon*, is the largest of all the wild sheep. This herd's main area of operation seems to be near the Gandhar la pass. In 1980, this herd consisted of 6 head, two of which were shot by SSB personnel. With the birth of one, the herd now numbers 5.

On the last stages of my trek in the beginning of May, I could observe marmots emerging out of their burrows after a long winter hibernation. Two species of marmot exist in the Himalaya, the long tailed *Marmot marmota caudata* and the Himalayan *Marmot-marmota bobak*. The latter is found in these areas.

Conclusion

My observations are based on a 500 km trek beginning 40 km south of Kargil and ending at Spituk near Leh. There is scope for a lot of study on Himalayan wildlife in these unspoilt areas, and I hope one day to have enough time and funds to do so. In collecting an approximate census on wildlife, I cross-examined statements, stopping at villages, talking to hunters and forest personnel, and to those, who had lost cattle or sheep to wolves or snow leopards.

In some of these areas exist perfect wildlife sanctuaries, their boundaries drawn by nature. I strongly feel that some of these areas be set aside as wildlife sanctuaries *NOW* before it is too late, too late to make amends.

NEWS

Rao Birendra Singh, Minister for Agriculture, Government of India informed the Lok Sabha that a National Institute of Wildlife Conservation will be established at Dehra Dun in the near future.

He also informed the Lok Sabha that constituent States of Indian Union have been asked to organize a separate Wildlife Department and prevent rampant poaching.

Wildlife conservationists congratulate Rao Birendra Singh for his efforts to conserve fast vanishing wildlife heritage. The steps taken, though late, are in the right direction.

—Editor

Man and Wildlife

S.P. SHAHI, I.F.S. (RETD.)

Former Chief Conservator of Forests, Bihar

"When the last individual of a race of living things breathes no more, another heaven and another earth must pass before such a one can be again"—William Beebe
(First Curator of birds, Bronx Zoo)

Wildlife strictly speaking denotes the entire flora and fauna, aquatic as well as terrestrial, including the whole range of plants, from fungi to forest trees and invertebrate as well as vertebrate life. In the pages that follow I shall confine to the larger terrestrial vertebrates though it is impossible to treat the larger terrestrial vertebrates in isolation from the rest of the ecological community. 'Man and Wildlife' presents a telling history of man's relationship with his natural environment which began with his own fight for survival. Primitive hunters felt closely akin to the beasts they had to slay in order to live. It was only after Man had begun to produce food crops from the soil, that he killed wholesale for meat, for furs, feathers, ivory and even for superstitious reasons. He deprived animals of their habitats, he slaughtered them because they fed upon his crops or competed with his domestic stock (Guggisberg).

When a Dutch fleet landed on Mauritius in 1598, the island was a superb tropical paradise uninhabited by man. Large birds which lived in an insular environment without predators had no power of flight and no fear of man. When one was picked, others assembled around and let themselves to be taken. These innocents, not aware of man's predatory nature, came to be called 'Dodo', using a Portuguese word meaning 'simpleton'. By 1681, not quite 100 years after it was first described, the species became extinct leaving us with the expression 'as dead as a dodo' to denote complete oblivion. It is thought that on that fateful morning of October 12, 1742 when Christopher Columbus watched the coast of North America taking shape, forty or sixty million Bison (*Bison bison*) were roaming over the North American wilderness. Townsend the naturalist saw a valley at least ten miles long and eight miles wide covered with Bison and no stretch of ground visible anywhere. A bloody and cruel carnage unequal in the history of the whole animal kingdom left a group of 20 animals in Yellowstone National Park in the United States (Guggisberg).

Thanks to solid action taken, there are 12,000 (twelve thousand) of them in the National Parks and National Refuges of the United States. While I mention this carnage, I am reminded of one of the most endangered mammal of the world today—our own Brown-antlered

deer (*Cervus eldi eldi*) in Manipur. *Sangai*, as it is locally called, some thirty in number, survive in an unique ecosystem of floating islets that grow tall reeds and grasses. These hardy annuals die and form a mat capable of supporting the *Sangai*, within Keibul Lamjao National Park. Following extract from a paper written by Sri Ashbindu Singh (Tiger Paper June 1980) is pertinent as it highlights today's man-animal relationship in many parts of the country, and I quote "The National Park is at present being heavily encroached upon by villagers for cultivation, fishing, collection of reed for firewood, edible roots and grazing of cattle. There was a violent demonstration in February 1979 against the enforcement measures in the Park. A mob of 600 (six hundred) people incited by vested (underline mine) interests.... set fire to dry grasses, check posts, staff quarters The main demand of the people is to reduce the area of the Park from 40 sq. km. to about 15. A local committee comprised of politicians, officials, and villagers has been set up to examine the issues *denovo*."

A deer is a prolific breeder—one fawn annually from the age of three. While comparisons are often odious, more so if made in such different habitats as Kanha (Madhya Pradesh) and Lamjao's floating islets, in the tranquil core zone of 940 sq. km. of the Kanha Tiger Reserve, Chital (*Axis axis*) population had increased from 9000 (nine thousand) in 1973 to 15,000 (fifteen thousand) in course of 5 years (1978), giving a population density of 16 per sq. km. at present. A closer study shows that while the population will certainly double and treble itself in due course, dispersal of population to new areas is a more heartening feature. The low lying swamp of Keibul Lamjao can perhaps best be compared with the famous Keoldeo Ghana Sanctuary (Bharatpur Bird Sanctuary; best known in Asia). There were about 375-400 chital in Keoldeo Ghana (Schaller and Spillet 1966). These animals occupied about 20 sq. km. of habitat or 15 to 20 animal per sq. km. With predators absence except *Homo sapiens*, Keibul Lamjao should support, I guess, a minimum population of a thousand *Sangai*. Inter-specific-stress in the *Sangai* population is between the animal and humans (unlike additional inter-specific and intraspecific stresses in other Parks). For an animal to snrvive in perpetuity it has to have a viable population and the present population of thirty, can by no stretch of imagination be a viable one. Shall we learn from American experience of Bison and save *Sangai* or reduce the Park area and allow it to go the DODO-way? I have dealt with *Sangai* in some detail as it looks to me a part of the syndrome that threatens Nature Conservation in general, and unique ecosystems in many parts of India today. It may be relevant here to mention UNESCO's recommendation on 'Man and the Biosphere Programme—MAB (Paris 20-24 May 1974). MAB programme proposes conservation of natural areas and their *genetic diversity* on a world-wide net work basis as "a means of maintaining the gene pools of species of plants, animals, and micro-organisms".

Will he have political courage to establish representative 'Biosphere Reserves' in different zoo-geographical terrains in the country ?

Wildlife lovers in their genuine efforts to help, invoke pantheons and remind us of our cultural heritage of 2000 (two thousand years) back. RGK writes "Kalidas and his works provide glimpses into a civilised society that stands in contrast to the inhumanity into which we have often lapsed. Rabindranath Tagore has said somewhere that the civilisation of India was created in the forests just as the civilisation of Hellenes was evolved in the city states." RGK further writes ".....the name Shakuntala itself is significant. She is a child of nature having been nourished by birds after she was abandoned by her celestial mother Menaka. Implied in the name is the kinship of man, bird and beast." (The Illustrated Weekly of India August 24 issue). So what ! Will it help Park-managers anywhere in India to mollify a forest dweller if he is told that Ashok was the first and perhaps the only monarch who 22 centuries ago defined a king's duty as not merely to protect citizens and punish wrong-doers but also to preserve animal life and forest trees ? Have they—the forest inhabitants—whose existence largely depends on forest products—heard of Kalidas, Shakuntala and of the sage Valmiki who two thousand years ago spoke 'MA NISHADA' (DON'T HUNTER) ?

The truth is man's basic relationship with animals has always been economic since prehistoric days. Animals have been man's longest and most fundamental preoccupation. For the greatest part of his existence on 'Earth' his survival has depended on his skill as a hunter. There is no doubt that of all the human activities, hunting has to be regarded as by far the most ancient, and out of it grew what was to become our culture and civilisation. Cave paintings which have survived through many epochs at Bhimbetka (45 km. southeast of Bhopal, Madhya Pradesh), Lascaux in Southern France and the Altamira in North Spain confirm this. These are all Mesolithic paintings. At Bhimbetka, there is an effusion of the wild game motif—the Gaur, the mythical boar, the swamp deer and the spotted leopard. There are also powerful scenes of masked hunters chasing the quarry. One particular painting depicts the caveman's obsession with wild game and the primeval hunter is seen stampeding a chital herd over a precipice. In the two caves in southern France and North Spain similar motif of bison, wild horses, reindeer are among the animals most often represented. The prehistoric hunter (new and artist too) in Mesolithic period was, after all not just drawing pretty pictures, either at Bhimbetka, or in far away France and Spain for his own edification, but he attempted to conjure the animals themselves on to the cave walls and to capture some of their life force, so that they would become vulnerable to magic influence. Man was still a food gatherer, his number was few and animals were too many. He did not think himself as something unique, fundamentally different from the rest of the

animal world. (We must remember that it took 2 million years for the human population to reach the first billion in 1830). Primitive farming originated around 10,000 (ten thousand) B.C. From 9000 (nine thousand) to 6000 (six thousand) BC sheep, goats and oxen became domesticated. The change-over from a food-gathering to a food-producing economy brought about a steady increase in population density. This is well illustrated by the fact that the 2000 (two thousand) years of Neolithic Age produced a thousand times more human skeletal remains than the 200,000 (two hundred thousand) Palaeolithic year preceding them.

Agriculture and animal husbandry were now bringing forth considerably more food than was needed. This meant that large number of people could turn away from farming and devote themselves to various crafts. Wealth began to be accumulated and it soon grew into an instrument of power. Leaders arose and kingdoms came into being. The wild animals, which had provided man with food over hundreds of thousands years, were still around but far from being the focal point around which all life revolved, they were now regarded as pests. They were vermins preying upon his herds, ravaging his fields and he protected his property by killing them whenever he could. *Hunting once a necessity on which human survival depended, had become a sport.*

Medieval followers of the chase were mainly armed with spear and sword. From the 13th century onwards, a new and fairly accurate weapon become available in the form of the crossbow, and in the 16th century firearms reached a stage of development that gave sportsmen another tremendous advantage over their quarry. Kings, princes, barons, bishops and privileged gentries shot large number of animals, often driven into enclosures and shot down by the ruler, his courtiers and his guests from a luxuriously appointed stand, to the accompaniment of prodigious feasting and drinking. The first half of the 19th century very nearly swept away Europe's game from the face of the earth.

In India too, the Moghul emperors from the thirteenth to the sixteenth century were famous as hunters. That Akbar the Great is said to have kept three thousand trained *Cheetah—Acinonyx jubatus*—(now extinct) with which to hunt antelopes, that several *Maharajas* shot over a hundred tiger each, one is said to have killed a thousand, British Civil servants vied to bag as many tigers, antelopes, deer etc., are facts too often repeated. What is noteworthy is the similarity of man's approach to animals, no matter whether he lived in Asia or Europe. In 1769, for instance, a Duke in Germany shot 200 rutting stags in less than a month, having them driven up to his gun one by one by a whole army of hunters and foresters. During World War I, Russians, Germans and the Poles slaughtered the European Bison (*Wisent*) uptill the last one was killed between 1919 and 1921. Finally only fifty six remained in zoos and private states. These were strictly preserved and in 1976 there were 1000 in Poland. American and European Bison were rescued from extinction. They are fine examples of what a few conservationists can do to remedy the thoughtless errors of the many.

Though very recent; such instances can now be cited for India too. The *branderi* barasinga, only available in Central India (Madhya Pradesh) that had come to the threshold of extinction is out of danger now. Its world population (confined to Kanha in MP.) had dwindled to a bare 66 in 1970. Its present number (June 1978) is 309.

For 'Gharial' (*Gavialis gangeticus*: the only species of Gavialidae in the world) present only in India, it was just ten minutes to midnight. A chain of breeding farms have saved this species during last five years. In Uttar Pradesh, to quote an instance, this crocodile was left with a remnant population of thirty individuals in the Girwa river of Bahraich Forest Division, U.P., has now (October 1979) nearly 1500 (fifteen hundred) gharials at its two breeding centres—Kukrail near Lucknow and Kotarnian Ghat in Baharaich district. Of these 500 were big enough to be released in the wild. There is the equally heartening news from Orissa. The Satkosh!a Gorge in Mahanadi, once reputed as one of the best Indian habitats to sight Gharials, due to indiscriminate shooting and the use of nylon nets for fishing, lost most of it and in 1975 only ten were left. Gharial Research and Conservation Unit (GRACU) has already released nearly 100 Gharials bred at the centre and proposes in the long run to release five hundred juveniles in Mahanadi. Lion Sanctuary at Gir (Gugarat), the only place where Asiatic Lion is now found is getting overcrowded. The number of lions has grown from 180 in 1974 to 200, a saturation point for the 1450 sq. km. sanctuary. A new sanctuary in Barda Hills neer Porbandar is proposed. Similar is the position of Rhinos in Kaziranga and a search is on for dispersing the crowded population. Increase in tiger population in various Tiger Reserves under 'Project Tiger' is too well known. From a little over 300 (1972); tiger's population in these Reserves is about 500 now (1978).

These examples though encouraging by themselves, are mere tiny specks—on an otherwise black canvass if we look at Conservation either at the global or at our country's level. 40% of the world's tropical rain forests—the richest environments on the planet—have been destroyed already. The rest are being felled and burned at the rate of 20 hectares a minute. 30 million sq. km. (19% of the earth's land surface) are threatened with desertification. More than a thousand vertebrate species and 25,000 plant species are threatened with extinction. (World Conservation Strategy, IUCN—UNEP—WWF, July 1978). The threatened extinction of 25,000 plant species is better appreciated when we remember that our main food requirements are served by only about 20 plant species which are now found throughout the world. The improved varieties of crop plants depend for some of their most valuable characteristics on the genetic raw material contained in the old indigenous varieties of crops or in their wild relatives. Geneticists and plant breeders are increasingly turning to wild sources to find new genetic material to infuse into their breeding stocks, to enlarge gene pools and to install badly needed qualities of hardiness and disease resistance. Our depen-

dence on wild crop plants as a natural genetic bank is increasing. Do we have any 'Plant Sanctuary'?

The pollution that threatens the world is the result of exponential growth, which started with the industrial revolution from about the middle of the 19th century. It took 2 million years for the human population to reach the first billion in 1830. The second billion took 100 years. The third, 30 years, the fourth 15 years, the fifth will be reached in 11 years in 1986 and the sixth in 9 years in 1995. Industrial growth and population growth are both exponential today. Both use finite resources found on this 'Earth'—the only one we have. The faster these resources are used up the sooner they will be exhausted" (Ranganathan: WWF—INDIA News letter No. 33)." The first country to evolve a government-backed family planning programme back in the 1950s when the rest of the world wasn't aware of the problem, India is today a trailing laggard in population control. After the loud propaganda of the mid-seventies, family planning has gone out of fashion. Election campaigns are conducted without a word of it. What was once a highly dramatic political issue has suddenly become taboo. India's population, which is expected to rise to 680 million by the time next year's census is completed, will have crossed 900 million and may be close to a staggering one billion by the year 2000. Each year India adds to its demographic chart almost the equivalent of the entire population of Australia i.e. over 13 million people" (India Today, June 16-30, 1980 issue).

According to Dr. Swaminathan, Member-Planning Commission, 6000 million tonnes of topsoil are washed or blown away every year, this represents a loss of 6 million acres of cultivable land every year. Environmental damage resulting from the misuse of land in India is pollution on a colossal scale. One of the most serious causes of land degradation is the encroachment of cultivation into areas that should not be cultivated, and their later abandonment. The cultivated land is often irreversibly degraded before it is abandoned, and the pressures on the surrounding marginal land grow so much that this also deteriorates through over-use.

There are two more environmental dangers in the intensive and specialised management of land. The first is that it is vulnerable to change, small changes in climate, for example, can make a crop that is bred for high performance under certain conditions fail. I am mentioning this to draw the attention of my erstwhile friends of the Forest Services to ponder whether the various Forest Development Corporations functioning in States are practising monoculture plantation forestry in the most *environmentally acceptable ways*!

Much attention has been given over the last 20 years of the controlled harvesting of mixed stocks of wild herbivores, on the grounds that population of wild herbivores are better adapted to making full use of range vegetation without damaging it. Such a thing is always fraught with danger. Recent massacre of Elephants in Zimbabwe where 1300 (half of population) have been shot in one single so called "culling" operation is a case in point.

I would like eminent conservationists to consider whether in Indian conditions a management of combination of domestic stock and wild herbivores will not yield encouraging result. We have the example of Mithun (*Bibos frontalis*), an artificial derivative from Gaur, that is found in North-East part of our country before us. I believe these domesticated Gayal are allowed to run by themselves through the forest, returning to the villages of their owners by nightfall. Could we experiment with other species in other vulnerable areas of the country?

I have alluded earlier to the IUCN's World Conservation Strategy document. Human activities need to be so managed that both the level of demand and the means of supply, at any given time and place, are compatible with the conservation of resources on which such activities depend. For this to occur, the five essential parameters (as quoted in the document) are 1. Political commitment, 2. better communication and application of knowledge, 3. better planning, 4. better institutions and 5. more knowledge.

On the political commitment side there is the latest good news that a Department of Environment (DOE) is proposed to be set up that will serve "as a nodal agency for environmental protection and eco-development, assume direct responsibility for pollution monitoring, conservation of critical eco-system (designated as Biosphere Reserves, referred to by me earlier)." (Times of India, 18th September 1980). Environmental protection in concurrent list of the Constitution is also mooted. There is also the suggestion, among several others, of setting up of a Central Cadre of scientific personnel for managing Biosphere Reserves and promotion of nature study at all levels of education and public communication. In short, what is being thought of complies with all the five parameters of the world Conservation Strategy.

These are all very well as far as they go, but to me it appears success will ultimately depend on their implementation by the various States. In 1976 (before the 1977 General Election) when Mrs. Gandhi was also our Prime Minister after Article 48 of the Constitution a new directive was included to read "THE STATE SHALL ENDEAVOUR TO PROTECT AND IMPROVE THE ENVIRONMENT AND TO SAFEGUARD THE FOREST AND WILDLIFE OF THE COUNTRY. "Forests" and "Protection of Wildlife and Birds"—as two distinct subjects—were brought on the Concurrent list. These stand. It is for us to consider how far we have stood by these new provisions of our Constitution. We have just ignored them.

Is the forestry personnel of the country equipped to look upon forest, not as a mere stand of trees but part of an ecosystem which today involves the concept of a dynamic equilibrium between all the factors, plant, animal, and non-living in the system?

A decade and a half back (1964) when Nehru wrote the foreward of E.P. Gee's book 'The Wildlife of India' he said "perhaps even more than in other countries, there is this difference between precept and practice. In no country is life valued in theory so much as in India, and many people would even hesitate to destroy the meanest or the most harmful

of animals. But in practice we ignore the animal world. We hold aloft noble ideals and shout many slogans but in our behaviour we belie them."

Some water has flown down the Ganges ever since Nehru wrote the above lines. There is an element of a little pragmatism growing now. The two thermal power stations at Agra which throw large volume of atmospheric pollutants will be closed down soon. Diesel shunters will be introduced in the broadgauge system in and around Agra to eliminate smoke by shunting engines. Research is on for washing the sulphur dioxide to be emitted by Mathura refinery; all these to save the Taj and its environment. Kerala is being asked to find an alternative to the controversial Silent Valley project. The Liontailed macaque (*Macaca silenus*) has the most restricted distribution of all the Indian monkeys, confined to a few evergreen forests of the Western Ghats. Barley 500-800 survive now with few troops in the Silent valley.

Many believe, that we must first solve the population problem to which all other problems are peripheral (including Conservation). Dr. Mongia, Meghalaya's Economic Adviser writes "Overall, the economy appears to have been growing at a rate of about 3%. In terms of per capita income this is a little less encouraging than it sounds, the rate of improvement has not been much higher than 1% a year. In terms of improving the levels of living, very little has been achieved." A massive expenditure to uplift the forest dwellers, and make them less dependent on forest looks a way out to save the forests and its wildlife. In a recent interview (September 24) the Prime Minister referred to the case of Punjab with its high agriculture growth and the highly literate state of Kerala where birth rate had come down.

There is also the view as stated by Mrs. Indira Gandhi at the U.N. Conference on human environment (Sweden June 1972) "the environmental problems of developing countries are not the side effects of excessive industrialisation but reflect the inadequacy of development. The rich countries may look upon development as the cause of environmental destruction, but to us it is one of the primary means of improving the environment for living, or providing food, water sanitation." And, she caught the bull by the horn when she asked "Will the growing awareness of 'One Earth' and 'One Environment' guide us to the concept of 'One Humanity'? Will there be more equitable sharing of environmental costs and greater interest in the accelerated progress of the less developed world?" The world is spending well over 400 billion dollars a year, almost a million dollars a minute on defence, robbing the world of resources needed in the war against poverty. The world is currently spending 20 times more on the military than it does on aid. Will this be reduced significantly?

Conservation seeks to regulate human use of the environment so that generations can benefit by yield in quantity of a great variety of goods and services (ecological economic, emotional and recreational ethical and cultural, scientific and intellectual).

It is within this complex socio-economic-ecological mosaic that 'Wildlife Conservation' in India will have to be planned.

Diseases in Gharial Juveniles

SHYAM LAL

Gharial (*Cavialis gangeticus*) hatchlings below one year in age suffer considerably from diseases and die in various numbers due to various known and unknown causes. There is no or negligible mortality in the Gharial yearlings and subadults.

In Uttar Pradesh gharial rehabilitation scheme was started since 1975. The survival percentage for various years was found more than 50%. The details of egg collection, hatchlings obtained and survival after one year age has been tabulated below:—

Year	Number of eggs collected	Number of babies hatched	Number of babies survived after one year	Survival percentages	Number of babies died	Mortality percentage
1975	38	21	12	57.1	9	42.9
1976	458	364	235	64.6	129	35.4
1977	712	632	334	55.8	298	44.2
1978	627	432*	236	55.8	196	44.2
1979	602	492**	236	48.0	256	52.0
1980	440	373***	180	48.1	193	51.9

*105 hatchlings at Katerniaghat Centre died due to deformation (Bend neck and weakness) in the year 1980.

**Large scale mortality occurred during 1978 and 86 hatchlings died at Katerniaghat.

***80 Gharials hatchlings died in Kukrail centre during 1980 summer.

The hatchlings died almost in every month hence the atmospheric changes cannot be considered as cause of death.

The cause of death of the hatchlings could not be over ascertained because of little and no knowledge about the diseases of gharials.

Following diseases were observed at Kukrail gharial rehabilitation centre which were treated like human beings and medicines were given to diseased animals in various doses.

- (1) Mouth Cancer.
- (2) Skin Diseases.
- (3) Gastric trouble.

Mouth Cancer

Symptoms and causes:—This is a fungal infection in the snout of the hatchlings, indicated by rotting of the snout bones and falling of teeth. The hatchlings face much difficulty in capturing fish, hence feeding becomes rather difficult.

Precautions:—The diseased hatchlings should be separated from the healthy ones as this is a contagious disease.

All hatchlings should be kept under close watch to prevent spread of the disease.

Treatment:—The affected parts to be scrapped with sterilized scalpal and treated with medicines indicated below:—

(1) Application of multifungine on the scrapped infected parts and keeping the hatchlings away from water at least for one hour to have effect of medicine.

(2) Application of 10% solution of acroflavin in absolute alcohol on the infected parts by brush and keeping the animal out of water for at least one hour.

(3) Application of the combination of the above two treatments have given better results. First application of 10% solution of acroflavin in absolute alcohol is done. After complete drying of the paste, application of multifungine is done.

Skin Diseases

Symptoms and causes:—This is a fungal infection under the arm pits, joints of limbs and over the back of the animal. The scaly skin starts decolourising and is ultimately flecked off.

Precautions:—The diseased animals should be separated from the healthy ones as in case of mouth cancer.

Treatment:—1. As in case of mouth cancer, the affected parts are rubbed with cloth or fingers and multifungin is applied. After keeping the animals away from water for about an hour the animal is allowed to go in water.

(2) Application of 10% solution of Acroflavin or crystal violet in absolute alcohol on the infected parts by brush and keeping the animal away from water for about an hour.

Application of the combination of above two treatments simultaneously gives better results as stated above in case of mouth cancer.

Gastric Trouble

Symptoms:—The stomach of the hatchlings swells up, they become sluggish and mortality starts at once. They also show shivering, and ultimately die.

Precautions:—The diseased hatchlings should be separated from the healthy ones. The feeding should be regulated from half to one fourth in case of healthy hatchlings and one fourth to nil in case of diseased ones. Only fresh fish should be provided.

Treatment:—The following medicines have shown improvement and helped in arresting the disease:—

- (1) Dygene 1/2 ml per day per hatchling.
- (2) 0.50 to 1.00 ml oral administration of *Furaxene*, per day per hatchling.
- (3) One ampule of "Vitamin B" followed by forced feeding.

The dead and diseased hatchlings were sent to laboratories of animal Husbandry Department at Lucknow and I.V.R.I., Izazat Nagar at Bareilly, I.V.R.I. has sent their report as under:—

- (1) Gharial baby was sacrificed.
- (2) Heart Blood, Smear and Impression, smear of lung, liver and spleen did not reveal any organism of etiological importance.
- (3) Lung congestion.
- (4) Liver, heart, kidney, brain, no significant changes were noticed.
- (5) Stomach contents—No clostridial toxin could be detected on biological test in mice.
- (6) **Diagnosis**—Nothing specific.

The outbreak of this disease was observed at Kukrail during April-May 1980, caused death of 80 hatchlings. Similarly outbreak of this disease at Katarniaghat Centre during July-August 1978 caused death of 86 animals.

The above treatments gave good results, provided fresh fish is given in food.

Gharial yearlings (more than one year in age) seldom suffer from any disease. There are rare cases of mortality in yearlings. The internal injuries caused by jumping of the juveniles in empty rearing ponds was established as the cause of death which can be reduced by taking proper care and keeping the yearling inside ponds at the time of release of water for cleaning the ponds.

Gastric Trouble

Symptoms:—The stomach of the hatchlings swells up, they become sluggish and mortality starts at once. They also show shivering, and ultimately die.

Mass Death of Wild Elephants in North-Cachar Hills

Report of a Survey (1949)

By

J.M. GOSWAMI

Sometime in July 1949 while I was camping at Lanka in the district of Nowgong, one Mikir Gaobura (village headman) came to me at my camp and informed me that he had seen two carcasses of elephants, one of them of a tusker, floating in the river Diyung, and further asked me if he could collect the tusks of the floating carcasses and also of other such as might be found elsewhere in the jungles. The latter part of his query roused my curiosity as to whether something untoward was happening in the wild elephant world as he was talking of other carcasses that might be available for tusks. On being questioned if he could give me an idea as to the approximate number of such deaths and the cause of it, he failed to give me a satisfactory answer. I could realise that the basis of his knowledge about deaths of elephants was more hearsay than first hand knowledge.

Just to get myself acquainted with actual state of affairs I contacted the Divisional Forest Officer, Nowgong, (Mr. M.N. Pait) who confirmed my information as true. We discussed the reasons of such deaths; but till then we had little idea that a large number of elephants had been attacked by some epidemic disease which was causing such a havoc.

After sometime, reports from various forest offices began to pour in, carrying information of death of wild elephants in different parts of North-Cachar Hills. But these reports did not state the reason why a large number of wild elephants had died so suddenly. Mr. Pait and myself contemplated a tour of the interior of the North-Cachar Hills to enquire into the number and cause of such deaths. Accordingly, the D.F.O., and myself in my capacity as an Honorary Forest Officer, arranged a programme of tour in the interior of the North-Cachar Hills. Heavy rainfall, absence of any communication in the interior, and other natural obstacles made it impossible for us to take up an immediate survey of the epidemic reported at the time.

We could not proceed earlier, but on the 2nd January, 1950, we were inside the jungles of North-Cachar Hills. Between Panimurt and Lonkujora we found, on the second day of our march, two skeletons of elephants, possibly of a mother and her calf, lying almost together. We could not have any authentic information regarding these two skeletons, as the place where they were lying was like a no man's land, as most parts of North-Cachar Hills contain endless jungles.

We proceeded onward and during our tour of the hills for about 15 days we came across many such skeletons of wild elephants. Whenever we went we were given to understand by the local people that many wild elephants had died in the jungles. Some told us that not only elephants but in some places a few bison, sambhar and bear also had died. We attempted to find out the cause of mortality from the people we met.

One Mikir Gaobura of Tongkrang village told us that he saw two wild elephants lying prostrate with profuse purging and unable to move. He noticed flatulence of their stomachs with complete aversion to food. In this way one elephant remained lying down for about a week and the other for a shorter period. He could not give us the name of the disease but I think it was nothing but Anthrax. One Sambi Gaobura of village Langbisa told us that he also personally saw several wild elephants lying with profuse purging and further informed us that the dung flew out like a streamlet. Again one Kachari villager told us that he saw two elephants dying at the top of the Lanllbong Hill with profuse purging mixed with blood. The same man showed me the skeletons of these two animals at the summit of the hill, when I personally visited the site. Similar were the reports that we received from the other people we met.

From the reports we were led to conclude that all the elephants that had died had suffered from anthrax, a highly contagious disease, and that it had appeared in North-Cachar Hills in an epidemic form at that time.

We came to learn that at two villages named Ldngringbra and Bazadisa about 20 domestic buffaloes had suffered from a similar disease and died. At that time there were heavy and incessant rains in the North-Cachar Hills. I think it was most likely that the germs from these domestic buffaloes got into the streams which the elephants and other wild animals used. It is therefore presumed that the immediate cause of the epidemic among the wild elephants originated from the affected village buffaloes.

While we were touring, in these areas we were informed that deaths of wild elephants had occurred on a far large scale in the jungles on the eastern and western side of the Assam Railway between Hatikhuli and Langting railway stations. I visited these places alone, camping at Langting for about a week. From my camp at Langting on a single march I found eight skeletons of wild elephants and one skeleton of a bison in the jungles on the eastern side of the railway line, and also found skeletons of three wild elephants and one skeleton of bison in the Langting Mupa Reserve on the western side of the railway line. Taking a closer view of these places and observing the surroundings I had reasons to believe that these places were once the abode and playground of wild elephants. But during my visit to these places I saw only one solitary wild elephant on the bank of the Hatikhuli pond. I presume this epidemic really had caused a havoc, as a result of which the whole area seemed

to be swept of wild elephants or abandoned by them. During an earlier march right in the interior of the hills we had come across 8 wild elephants in all on two occasions (5 on one occasion and 3 on another), a phenomenon very unusual for the famous wild elephant abode of this province. We therefore presumed that the loss had been several indeed.

To compensate for this unusual loss of (recommend the) elephant-wealth of our province and as a measure of preserving this diminishing stock of wild elephants, I strongly recommended the closure of the elephant catching operations (both mela and Kheddah) temporarily for at least for two consecutive years on an experimental basis throughout the province to replenish the stock. In this connection I believed the question of losing a part of Government revenue should not stand in the way, as this will be amply compensated for in the long run. This point appeared to me most vital requiring urgent attention of the Government in view of the alarming state of rapid denudation of the wild elephants caused by such epidemic and annual capture of large number of elephants.

Taking into account the figures of death collected from skeletons we came across and from recovery of tusks by the forest Department so far; we located the death of 74 wild elephants, three bisons (which were personally found by me during the March inside the jungle and three bears (reported by the Beat Officer—Langting Forest Beat). From this data we may safely infer that a similar number of death must have gone unnoticed in view of the limited area where we moved, and the vast area left unsurveyed. Although, as stated above, the deaths were more localised on both sides of the Hill Section of Assam Railway between Lumding and Mupa railway stations, the skeletons of dead elephants were found scattered all over the North-Cachar Hills under the administrative control of Nowgong Forest Division and in the neighbouring Jaintia Hills under the administrative control of Khasi and Jaintia Hills Division. It also should be noted that the vast area of North-Cachar Hills under the Cachar Forest Division remained unsurveyed.

Before concluding, I should like to put forward a suggestion for prevention of the outbreak of such disease among the wild animals in an epidemic form. From what I observed, I am of the opinion that a disease usually first breaks out among domestic animals in the villages just bordering or within jungles inhabited by wild animals. Want of proper care and treatment allows the diseases to take epidemic form and ultimately it spreads among the wild animals in the vicinity. So it is just and proper for the neighbouring villagers to communicate to the nearest civil authorities for proper steps and guidance whenever any animal disease breaks out in their villages. This fact should be impressed upon every such villager at the earliest opportunity. It should however be noted that the terrain where these elephants have made their natural abode is difficult and the villages are scattered over a very large area making them inaccessible throughout the major

part of the year. Information travels at very slow speed in such areas, making immediate action almost impossible when such an epidemic breaks out. To counter-act this, periodical inoculation against contagious disease like anthrax and rinderpest of all cattle in the villages might produce some effective check. The area under reference being a Scheduled area, an effective measure can be taken by proper authority by executive order only.

Sd/- (J.M. Goswami)

Honorary Forest Officer, Nowgong

OBITUARY

The President, the Executive Committee and Members of the Wildlife Preservation Society of India and those interested in wildlife conservation in the country and abroad are grieved and mourn the sad demise of Saroj Raj Choudhry, I.F.S., Director, Simlipal National Park, Orissa, an eminent Wildlife Researcher and foster father of Khairi—the world famous tigress—and an eminent wildlife conservationist who breathed his last on Tuesday, the 11th of May, 1982 after a massive heart attack.

He was an honoured member of the Wildlife Preservation Society of India and through his learned original work and writings in Cheetal, raised the journal to the position of top most wildlife journals in India and the world.

The society conveys sincere condolences to the bereaved family. May God give them the strength to bear the loss with fortitude and may his soul rest in peace.

Letter to the Editor

Rejoinder to Mr. Roy's "Letter to the Editor" Cheetal, June-September 1981

Mr Roy's vitriolic outburst against my article on Sri K. Sankhala's book: **TIGER** and his lengthy diatribe against me—smack of a holier-than-thou attitude of a sanctimonious preacher who does not believe in practising what he preaches. He writes that: "Singh's criticism is a confused mass of self-contradictory statements". These are the exact words I would use to describe Mr. Roy's own criticism of my article. He appears to be well and truly confused and mixed-up, as he repeatedly contradicts his own ideas and suggestions etc.

He accuses me of not having gone through Sri Sankhala's book thoroughly. It is obvious that Mr. Roy is guilty of this very same thing. While writing about co-existence of leopards and tigers, he states: "Corbett's view does not limit such co-existence since the panther is mainly a nocturnal hunter as opposed to the tiger — —". Sri Sankhala clearly mentions in the topmost line on page 25 of his book: **TIGER**: "Most of his (tiger's) hunting is done after dark — —". The word "tiger's" has been inserted by me, so that Mr. Roy may not get further confused. Even a child from any forest village can tell Mr. Roy that both normal panthers and normal tigers are mainly nocturnal hunters. Perhaps Mr. Roy in his 40 years of study of wildlife has made this new discovery that only leopards (panthers) hunt at night while the tiger sticks to hunting during the day time. Mr. Roy while accusing me, misquoting from Sri Sankhala's book, has done the same thing about Corbett's books. Writing about *man-eaters* and not *normal* leopards and tigers, Corbett does mention that a man-eating leopard kills his victims at night as opposed to man-eating tiger which operates mainly in daylight hours.

Mr. Roy accuses me of canonising some well known figures, by holding them up as infallible and goes on to remind me that personal loyalty and friendship has no place in scientific work. It is obvious that it is mainly Mr. Roy's loyalty and friendship of Sri Sankhala that has made him write his long winded "Letter to the Editor" by which he tries to uphold his friend as infallible.

No matter how sarcastically meant, I am greatly flattered by Mr. Roy's view that I appear to subscribe to the stance taken by our "ace conservationists". I presume the "ace conservationists" are all people who do not see eye to eye with Mr. Roy. He blames these "ace conservationists" for sweeping under the carpet any facts that might impair the image of a "legendary" or "internationally famous" person. It appears that Mr. Roy is quite a "Knight of the Broom" himself, as he has tried so hard to sweep under the carpet all facts that might impair the image of the author of "**TIGER**".

Mr. Roy tries to justify Sri Sankhala's disagreement on many points with Chaturvedi, Corbett and Sen — on the other hand he feels strongly if I happen to disagree with the views of

Sri Sankhala. I have no quarrel with Sri Sankhala. In my Article on his book I have just pointed out some facts on which I do not agree with Sri Sankhala, facts which are irrefutable. I have no desire to repeat all I have written in my article, the following few examples will suffice:-

1. Sri Sankhala's contention that the average length of an Indian male tiger is 10 feet, is quite incorrect, and against all facts.

2. Most Indian male elephants definitely do have tusks. Sri Sankhala is not correct in saying that few of these have tusk and are therefore not hunted for ivory. For Mr. Roy's information I would like to add, he himself is quite incorrect in saying that female Indian elephants do not have tusks. As mentioned in my article, some females do have tusks which are much smaller and thinner than a male's. Mr. Roy is at liberty to come over any time he likes and I will show him quite a few female elephants with small tusks.

3. According to Sri Sankhala, the Four Horned Antelope (Chausinga) can be seen easily during day time *only in Sariska*. This is against all facts.

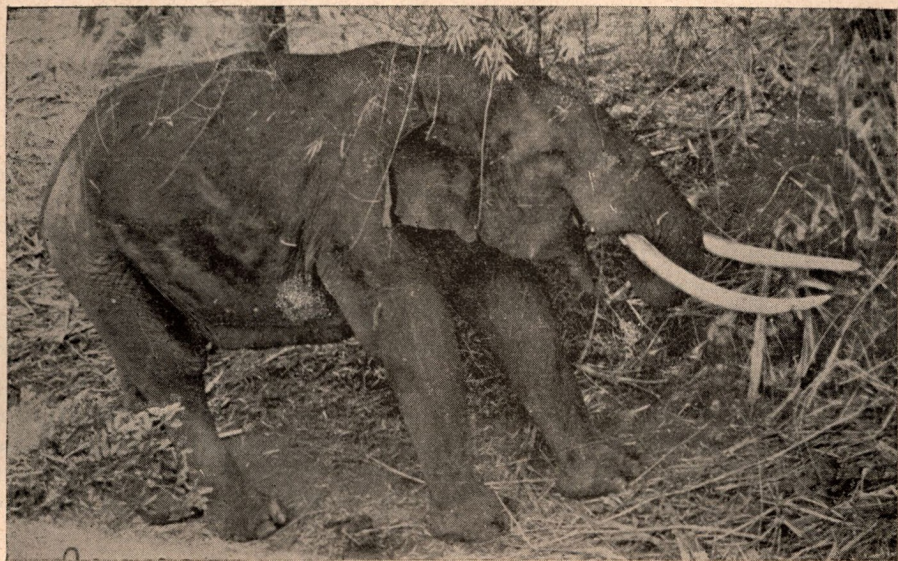
4. When a tiger can kill the biggest bovine in the world: Gaur, how can the killing of a Nilgai present any problem. For Mr. Roy's information I would like to add that a Nilgai's horns can hardly be compared to a stiletto, as they are fairly blunt as compared to even the shorter tines of a Chital or Sambar, or the horns of a black-buck.

Mr. Roy is ill informed about the role of Hunting Sportsmen in wildlife conservation. Hunters certainly do make the best conservationists. Practically all the topmost Game Wardens in Africa have invariably come from the ranks of Hunters. The same condition is true of many other countries of the world. As mentioned in my article, there are numerous Clubs and Associations of Hunters that have done great work and spent millions of Dollars on game conservation. If wildlife is depleted, no non-hunting Naturalist stands to lose as much as an ardent Sporting-Hunter.

No doubt, as claimed by Mr. Roy he has all the books by Corbett and presumably by other authors also. It is astounding the amount of information one can pick up from books, specially if one studies them for 4 years as Mr. Roy seems to have done, but this can hardly be termed as studying wildlife with an open mind. It is quite a coincidence that the watchman of the Indian Museum at Calcutta, about Mr. Roy has written, also happened to spend 40 years at his work without becoming the greatest expert on the Museum treasures.

Happy wildlife studying in the New Year—Mr. Roy.

Giri Raj Singh
Sahanpur



The Wildlife Preservation Society of India

1. The aims and objects of the Society are :—

- (a) To promote interest in and impart knowledge regarding the preservation and conservation of all forms of wildlife, particularly among the youth of the country.
- (b) To co-operate with the Govts. of India and States and with other Societies and Institutions having similar aims and objects in working for the interests of wildlife.
- (c) To assist in enforcing and actively supporting the Forest Acts, Wild Birds and Animals Protection Acts and Rules etc. of States and the Indian Arms Act and Rules in so far as they pertain to wildlife and to bring to the notice of the authorities any infringement of the same and to assist in the detection and prosecution of offenders in respect of such laws.
- (d) To advise and help the Govt. and wildlife administrators in the formation, maintenance and protection of Sanctuaries and National Parks, the preservation of wildlife in general and rare species of India in particular and in the introduction of exotic species into the country, the rehabilitation of rare species etc. and in the revision on rational lines of the shooting and fishing rules, so as to conserve and increase wildlife stocks.
- (e) To raise funds for the carrying out of the above aims and objects and to found and maintain museums, reading rooms and libraries of natural history in order to disseminate knowledge regarding wildlife.
- (f) To promote sportsmanship in shikar and to recognise well regulated shooting and fishing, as a means of preserving wildlife and fish so that through wise use the surplus may provide a recreational asset to the nation.
- (g) To carry out publicity and propaganda for the preservation of wildlife in India by means of monographs, journals, films, film strips and other feasible methods.
- (h) To assist members of the Society in obtaining shooting and fishing facilities and facilities for viewing and photographing wildlife in India.
- (i) To conduct research into the problem of Wildlife management in India, and in pursuance of this, to initiate, encourage and, where possible assist in projects for the study of threatened species and related subjects and to provide reference and research facilities for such work.
- (j) To carry on such other activities which will serve the above subjects.

What membership of Wildlife Preservation Society of India will entitle you to ?

1. You will become an active member of the growing group of Wildlife enthusiasts, who enjoy working for and spreading the knowledge of how to conserve India's heritage of Wildlife for posterity.
2. You will be entitled to the full use of the library of the Wildlife Preservation Society and of its reading room.
3. You will receive a membership certificate.
4. You will receive personal Identification and Membership card.
5. You will be entitled to buy all publications of the Society at a concessional rate.
6. You will be entitled to buy at concessional rates the Society's Tie, and the Balance of Nature Game (specially published in colour for its educative and recreational value).
7. You will be supplied "Cheetal", journal of the Society free.

For membership particulars write to Honorary Secretary, Wildlife Preservation Society of India, 7 Astley Hall, Dehra Dun.